Aalto University
School of Business

# RELATIONSHIP BETWEEN MERGER GAINS AND ECONOMIC CYCLE

A study of public companies based in the United States

Bachelor's Thesis
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**Abstract of bachelor's thesis**

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**Abstract**

This thesis explores the effect economic cycle has on merger gains of public companies incorporated in the USA. Completed mergers announced from 1990 to 2019 with a value over $50M are subject to this study. The economic cycle is divided into two categories: *normal or strong economy* and *weak economy,* and the mergers are classified into said categories based on their announcement dates. The merger gains are measured as cumulative abnormal announcement returns and as three-year post-merger buy-and-hold abnormal returns. My results show that the mergers initiated during periods of weak economy have significantly weaker three-year post-merger performance compared to the ones initiated during good or normal economy. Results considering announcement returns are corresponding, but not as conclusive.

**Keywords** mergers, merger gains, economic cycle, merger waves

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# *1. Introduction*

## *1.1 Contribution of this thesis*

In this thesis, I establish a relationship between weak economic situation at the time of merger announcement and weakened performance of the participants' stocks. The relationship is tested with linear regressions, where abnormal returns of mergers' participants during the announcement periods and during the three-year post-merger periods are the dependent variables, and dummy variables indicating, whether the merger is announced during a period of weak economy, are the primary explanatory variables. This effect of weakened performance is observed as negative and statistically significant regression coefficients of weak economy – variables in regressions of both, the announcement period's abnormal returns and three-year post-merger abnormal returns.

No studies strictly considering the relationship between economic cycle and merger gains have been published in the leading financial journals, albeit mergers are an extensively studied phenomenon in finance. Thereby, as far as I know, the found relationship between weak economy and weakened returns of merging companies has not yet been recognized in the field of finance.

Additionally, I recognize, that in my sample, mergers occurring on merger waves underperform mergers occurring off waves in the post-merger period, which is a broadly accepted phenomenon among researchers. Furthermore, I document tender offers yielding higher announcement period returns for the acquiror and the target, and average announcement period returns being slightly negative for acquirors whereas targets on average gain significantly. These results are consistent with the previous research.

## *1.2 Theoretical framework*

Because academic finance has not studied the relationship between economic stage and merger gains, there are no previous studies that would be strictly comparable. Thereby, I strive to develop a theoretical framework for my study primarily by applying the findings of largely merger wave - focused literature. However, in the field of strategic management and business-oriented economics Kusewitt (1985); Pangarkar and Lie (2004) and Tse and Soufani (2001) have studied subjects related to the subject of this thesis, and next I briefly address their findings.

Kusewitt (1985) concludes that merger's timing on the market cycle and long-term returns of the acquiror have negative correlation. Nonetheless, Kusewitt studies only very active acquirers, and uses market cycle as a proxy instead of economic cycle. Pangarkar and Lie (2004) study 115 Singaporean acquisitions, and find that during weak economy announcement period profits of acquirers have been higher and significant at 5% level. However, this result considers only the announcement period, and cannot be generalized to other markets because of differences in characteristics of USA's and Singapore's merger markets and the small sample of the study. Contrarily, Tse and Soufani (2001) explore periods of high – and low merger activity in the UK during 1990's and find indications of weaker performance of mergers during economic downturns.

Majority of academic literature in finance finds merger gains being insignificant or slightly negative for the acquires' shareholders (Andrade et. al (2001); Duchin and Schmidt (2013); Servaes (1991)), while targets' shareholders have significantly positive gains. However, Langetieg (1978) shows that the calculated results are not always consistent between different methodologies. Indeed, e.g Asquith et. al (1983) document positive returns for acquirers, whereas Wang (2018) argues that while acquirors' gains appear slightly negative, potential merger profits are capitalized in their pre-merger valuations, mergers thus being in fact value creating.

Academic world is fairly unanimous of the idea that there are a multitude of motives for mergers, and that magnitudes of different motives varies over time. Nguyen et. al (2012) make a distinction between value increasing and value decreasing motives. Synergies, both operational and financial, are the most important value creating motives. On the contrary, the authors name agency-based motives, hubris and market timing as value decreasing motives. Based on their results, mergers are often initiated due to a combination of several motives, both value increasing and decreasing, which makes it complex to accurately assess individual mergers' motives. This complexity can be seen as varying and often conflicted explanations for merger waves.

There is strong evidence that merger waves are pro-cyclical i.a Komlenovic et. al (2011). However, the explanation for this pro-cyclicality divides views of academics. Indeed, Rhodes-Kropf and Viswanathan (2004) argue that high market valuations drive merger waves, while Harford (2005) claims that capital liquidity has more explanatory power than the market timing. In addition, Duchin and Schmidt (2013) suggest that behavioral reasons, such as managerial herding and several agency problems are stronger during merger waves and may in fact amplify these waves.

Duchin and Schmidt (2013) report that on wave acquisitions have significantly weaker post-merger performance compared to mergers outside of waves. They document an average -0.22 three-year buy-and-hold abnormal return (BHAR) for on wave acquisitions, while BHAR for off wave acquisitions is on average -0.06. The authors suggest this weaker performance is due to diminished shareholder supervision, lower CEO turnover-performance sensitivity and poorer quality of analysis. They argue that CEOs are less likely to be fired after unsuccessful on wave acquisitions, because they just acted similar to others.

It is not unambiguous, what kind of effect these factors presented by Duchin and Schmidt (2013) have on mergers occurring during weak economy. It is reasonable to argue that during weak economic stages companies and CEOs would be under higher pressure and shareholder supervision, and that managerial herding and hubris should not lead to unnecessary mergers. Indeed, Pangarkar and Lie (2004) explain their results of stronger performance of Singaporean weak - economy acquirers with the absence of this detrimental managerial behavior. On the other hand, during weak economy CEOs might still be able to justify poor post-merger performance with difficult economic stage, and the quality of analysts' forecasts could be weaker due to higher uncertainty.

Rhodes-Kropf and Viswanathan (2004) show that market overvaluation raises the probability of mergers even without underlying reasons for merging. On the contrary, market undervaluation decreases the probability of mergers, including the mergers that would be economically justified. If during weak economy market is indeed undervalued and that undervaluation halts mergers, a major share of mergers occurring under weak economy could be so-called forced mergers. Duchin and Schmidt (2013) suggest that the returns of these forced mergers are expected to be lower, because they are not initiated by choice but by necessity.

## *2. Research questions and hypothesis development*

The main objective of my study is to find out, whether abnormal merger gains are different during weak economical stages than during normal or strong economy. Thereby, my primary research question is; Does weak economy affect the abnormal merger gains? As a secondary research objective, I examine how the abnormal returns of on wave mergers compare to the abnormal returns of off wave mergers, in order to replicate the commonly accepted phenomenon of merger waves being value destructive.

Empirical theory and academic literature provide evidence of several factors affecting merger gains. A large part of these factors has different behaviors depending on the economic stage. Thereby, it is reasonable to assume that weak economy would affect abnormal merger gains. However, arguments supporting both, weaker and stronger performance of mergers occurring during weak economy can be developed. Arguments for stronger performance of mergers during weak economy can be based on absence of behavioral reasons such as hubris and managerial herding, that according to Duchin and Schmidt (2013) are likely to lead to economically unjustified mergers and weaker performance. Indeed, Pangarkar and Lie (2004) document stronger announcement period performance of Singaporean mergers during weak economy and explain their result with absence of these detrimental factors.

On the contrary, a larger share of forced mergers could lead to a weaker performance of mergers during weak economy. This argument is supported by findings of Rhodes-Kropf and Viswanathan (2004) considering market undervaluation's tendency to halt also economically justified mergers, and Duchin and Schmidt's (2013) reasoning of lower yield of forced mergers. If majority of economically justified mergers are called off because of the low liquidity and high uncertainty that often characterize the periods of weak economy, and a large part of the mergers occurring during those periods are done by necessity, expected abnormal returns for weak economy mergers would be weaker than the returns during other economical stages.

Thereby, the null hypothesis for the primary research question is that *weak economy does not have an effect on the abnormal merger gains,* which would imply that the factors with assumed opposite impacts cancel each other out, or their behavior is not dependent on the economic stage. The alternative hypothesis *H1* is that *weak economy has an effect on the abnormal merger gains*. *H1* can be divided into *H1a: Mergers initiated during weak economy outperform other mergers,* which would support the positive contribution of the absence of detrimental behavioral reasons during weak economy, and *H1b*: *Mergers initiated during weak economy underperform other mergers*, which would support the negative contribution of a large share of economically unjustified forced mergers.

# *3. Data and methodology*

## *3.1 Sample selection*

My data consists of completed US domestic mergers announced between 1990 and 2019, where the announcement date is defined as the first public announcement of merger intentions from the acquiror or the target. Both, the acquiror and the target, have to be public companies listed in the USA. Mergers are required to have a deal value of at least $50M, and the relative size of the acquiror and the target has to fulfill the following restriction: $MV_{Target}/MV_{Acquiror} \geq 0.1$ and $MV_{Acquiror}/MV_{Target} \geq 0.1$, where $MV_{Target}$ and $MV_{Acquiror}$ are the market values of the target and the acquiror four weeks prior to the merger announcement. The relative size is restricted, because if one of the participants, presumably the acquiror, is too much larger than the other participant, the effect of the merger may not be visible in the larger participant's share price. Acquiror cannot hold 50% or more of target's outstanding stock prior to the announcement, and it has to hold 100% of the target's stock at the end of the merger. The event data has to be available in Thompson Reuters Eikon, and price data for the acquiror and the target has to be available in Thompson Reuters Datastream.

I have a few additional and slightly differing data requirements for my tests of announcement period cumulative abnormal returns (CAR) and three-year post-merger buy-and-hold abnormal returns (BHAR). In order to have larger samples, I apply these requirements separately for the data I use for the two tests, thus ending up with two slightly different samples. I use this method, because the number of mergers occurring during weak economy is relatively small and using a dataset that would satisfy all requirements for both tests, would further narrow the sample. However, additional tests for a sample satisfying all requirements are conducted in *section 5*, and the primary results remain robust for this sample. Thereby, conclusions that combine results of announcement period tests and post-merger performance tests, can be made with relatively high confidence.

Sample size for the announcement period CAR-tests is 1014 completed mergers, of which 137 occurred during weak economy. Mergers included in the CAR-test have to be completed within 365 days of the announcement date. Daily price data for the both participants of these mergers is required to be available in Thompson Reuters Datastream for the period from 230 days prior to the announcement to the completion of the merger. In addition, the stocks of the participants have to have an adequate liquidity in order to calculate unbiased market model parameters. Here the adequate liquidity is defined as less than 20 days of 0% price change during the 230- to 30-day period prior to the announcement, which is used to determine the market model parameters.

Requirements for the three-year BHAR-test result a slightly larger sample of 1183 completed mergers, of which 151 were classified as occurring during weak economy. Here the requirements for pre-merger price data availability have been removed, but three new requirements have been placed. First, acquiring company's price data for the three-year period after the merger has to be available in Thompson Reuters Datastream. Bankrupt or delisted companies are included in the sample until their delisting date. Second, the merger has to be completed prior to 1.1.2017 and third, the primary four-digit SIC-code of the acquiring company has to be available in Thompson Reuters Datastream.

## *3.2 Tests and methods*

The effect weak economy has on mergers' returns is tested primarily with OLS multiple linear regressions. Separate tests are conducted to abnormal returns of announcement period and to abnormal returns of three-year post-merger period. Announcement period returns are examined with -10 + 5-day announcement window, and with the entire announcement period. The -10 + 5-day test is given more value, since it diminishes the potential distortions caused by possibly inaccurate market model parameters. In addition, I test the significance of differences in average abnormal returns during and outside of weak economy and on - and off merger waves.

In both regression tests, the abnormal returns are the dependent variables, and dummy-variables representing time periods of weak economy are the primary explanatory variables. Because merger waves have been documented to have a significant effect on the abnormal merger returns (e.g Duchin and Schmidt (2013)), and the waves are pro-cyclical, a merger wave dummy-variable is included to control the presumably negative effect merger waves have on the abnormal returns of mergers occurring during those waves. Control variable for tender offer is also included, since e.g. Servaes (1991) finds tender offers yielding higher returns, than the other forms of deals. The relative size of the target and the acquiror is controlled with a *Relative size* – variable defined as the ratio of $MV_{Acquiror}/MV_{Target}$, where $MV_{Target}$ and $MV_{Acquiror}$ are the market values of the target and the acquiror four weeks prior to the merger announcement.

For -10 +5 - day announcement window's and for the entire announcement period's cumulative abnormal returns (CAR's), linear OLS regression models are estimated for acquiror's, target's and for combined returns, resulting total of 6 regression models. Estimated models are the following form:

$$CAR = \alpha + \beta_1(Weak\ economy\ dummy) + \beta_2(Merger\ wave\ dummy) + \beta_3(Tender\ offer\ dummy) + \beta_4(Relative\ size),$$

where $CAR$ equals the cumulative abnormal returns of acquiror, target or their combination during the entire announcement period or the -10 +5 – day event window; weak economy dummy equals 1 if the

merger is announced during period of weak economy, otherwise 0; merger wave dummy equals 1 if the merger is announced during a merger wave, otherwise 0; tender offer dummy equals 1 if the form of the deal is tender offer, otherwise 0; relative size is the market value of the target divided by the market value of the acquiror four weeks prior to the announcement.

Linear regression model of the following form is estimated for the post-merger performance:

$$BHAR = \alpha + \beta_1(Weak\ economy\ dummy) + \beta_2(Merger\ wave\ dummy) + \beta_3(Tender\ offer\ dummy) + \beta_4(Relative\ size),$$

where $BHAR$ equals the three-year post-merger buy-and-hold abnormal returns of the acquiror, and the explanatory variables are defined as in the announcement period's regressions.

## *3.3 Calculation of abnormal announcement returns*

Announcement period's abnormal returns are calculated for -10 to +5-day event window, where the event is the first public announcement of intentions to merge, and for the entire announcement period from 30 days prior to the announcement to the delisting date of the target. Adjusted stock prices of the merging companies are used, which eliminates the price distortions caused for example by dividend payments. The abnormal daily returns are constructed below. Definitions of the variables are presented in *Table 1*.

Daily returns $\boldsymbol{R_{i,t}}$ for company *i* for day *t* are $R_{i,t} = \frac{P_{i,t}}{P_{i,t-1}} - 1$. The abnormal returns $\boldsymbol{R_{A_{i,t}}}$ for company *i* for day *t* are calculated following the CAPM: $R_{A_{i,t}} = R_{i,t} - rf_t - \beta_i\left(R_{M,t} - rf_t\right)$.

The abnormal daily returns of acquiror and target are cumulated separately for the entire announcement period following the equation $CAR_i = \prod_{t=1}^{T}(1 + R_{A_{i,t}}) - 1$, where $CAR_i$ is the cumulative abnormal return for company *i* for the entire announcement period, *T* is the date the merger is completed and the

*Table 1 – Definitions of variables used in calculation of abnormal announcement returns*

| Variable | Definition |
|---|---|
| $P_{i,t}$ | Closing price of company *i's* stock for day *t* |
| $rf_t$ | Risk-free rate for day *t:* Risk-free rate is the daily 3-month T-bill rate retrieved from Thompson Reuters Datastream. |
| $R_{M,t}$ | Market return for day *t*: Returns of SP500 index are used as the market proxy. The index value is downloaded from Thompson Reuters Datastream. |
| $\beta_i$ | Market beta for company *i:* Market betas are determined based on price data of period starting 230 days prior to the announcement and ending 30 days prior to the announcement. |

target is delisted, and *t=1* is the first day of the period, starting 30 days prior to the announcement. Average time between the announcement and the completion is 136 days, ranging from 26 to 365 days. The combined, return for merger is calculated by weighting acquiror's and target's CAR's with their market values four weeks prior to the announcement. Value of target's shares held by the acquiror is subtracted from the market value of the target.

Announcement returns for -10 to +5-day event window, event being the merger announcement, are also examined, and preferred, in order to diminish the potential distortions caused by possibly inaccurate market betas. The abnormal returns for -10 to +5 period are calculated with the same method than the abnormal returns for the entire period, with the difference of *t=1* being the date 10 days prior to the announcement, and *T* being the date 5 days after the announcement. Combined returns are also calculated for the -10 to +5-day event window.

## *3.4 Calculation of 3-year post-merger returns*

Post-merger performance is evaluated with 3-year buy-and-hold abnormal returns (BHAR) of the acquirors. Following Duchin and Schmidt (2013), BHAR for company *i* is defined as the subtraction of *i's* benchmark's cumulative returns from company *i's* cumulative returns during the chosen time period:

$BHAR_i = \prod_{t=1}^{T}(1 + R_{i,t}) - \prod_{t=1}^{T}(1 + R_{Benchmark\ i,t})$

Where $R_{i,t}$ is defined as in announcement period's returns, but with monthly closing prices, *t=1* is the month following the merger's completion, and *T* is the month 36 months after the completion of the merger. Even though, if company *i* is delisted during the 36-month period, *T* equals the month of delisting.

Benchmarks for companies are the Kenneth French's 48 industry portfolios (French (2020)). Companies are matched with the benchmarks based on their four-digit SIC-codes. Companies' benchmark returns are the equal weighted returns of their matched portfolios. Equal weighted returns are used, because some of the benchmark portfolios only include a few companies during some time periods, and thus using value weighted returns could lead to one peer company having a significant effect on the benchmark's returns.

As Viswanathan and Wei (2008) show, BHAR in often a significantly downwards biased measure. Therefore, no conclusions considering the absolute abnormal returns of companies should be done based on BHAR. Nevertheless, if the bias is relatively similar for the abnormal returns of companies merging during and outside of weak economy, BHAR can be used to compare performance of the mergers.

## *3.5 Classification of weak economy*

I classify economic cycle to two stages; weak economy and normal or strong economy. The classification is based on the National Bureau of Economic Research's (NBER) chronology of US Business Cycle Expansions and Contractions NBER (2020). Here weak economy is defined as time from the month following the peak date to 12 months after the through date. This classification leads to three periods of weak economy between 1990 and 2019. The first period starts in August 1990, and the second period starts in April 2001. Both these periods last for 20 months. The third period of weak economy starts in January 2008 and lasts for 30 months. In total, 70 of 360 months of the examined period are classified as weak-economy months. In *Chart 1* periods of weak economy are compared to the SP500 index. Weak economy – status is given for the mergers based on their announcement dates, because evaluating the situation where the merger is initiated best captures the potential differences in motives to merge. Thereby, a merger is classified as weak economy merger if it is announced during a period of weak economy, even if it is taken to completion during normal or strong economy.

## *3.6 Identification of merger waves*

I use a method essentially similar to Harford (2005) in identification of merger waves. I use Thompson Reuters Eikon data of all completed US mergers and acquisitions with a value larger than or equal to $50M between 1990 and 2019. Each deal is assigned to a month based on its announcement date, and to an industry based on Thompson Reuters Eikon's definition of acquiror's macro industry. Next I calculate for each of the three decades and for each of 12 industries[1] the 24-month period of highest M&A activity. These 36 periods are potential merger waves. Thereby, each industry has one potential merger wave on each of the three decades.

I test the significance of these potential waves by creating one thousand simulations for each industry $i$ and decade $d$, where every deal placing in industry $i$ during decade $d$ is assigned to a new month on decade $d$ drawn from even distribution. Thus, if for example 50 deals take place in industry $i$ during 1990's, each of the 50 deals is individually assigned to the period between January 1990 and December 1999 with an even probability of $1/120$ for each month. Simulated 24-month periods of the highest M&A activities are calculated for each $i$ and $d$ in each of the thousand simulations. If the number of deals on a potential wave of industry $i$ during decade $d$ is larger than or equal to the 95$^{th}$ percentile of the simulated numbers of highest M&A activity on industry $i$ during decade $d$, the potential wave is identified as an actual merger wave. A vast majority of merger waves are placed in the late 1990's and in the early 2000's, as demonstrated in *Chart 2*.

1) The 12 industries based on Thompson Reuters Eikon's macro-industry definition are Consumer Products and Services, Consumer Staples, Energy and Power, Financials, Healthcare, High Technology, Industrials, Materials, Media and Entertainment, Real Estate, Retail and Telecommunications.

*Chart 1 – Periods of weak economy and SP500 index*

Periods classified as weak-economy periods are highlighted with black on the horizontal axis. SP500 index on base 2 logarithmic scale is included in the chart for comparison. SP500 monthly values are downloaded from Thompson Reuters Datastream.

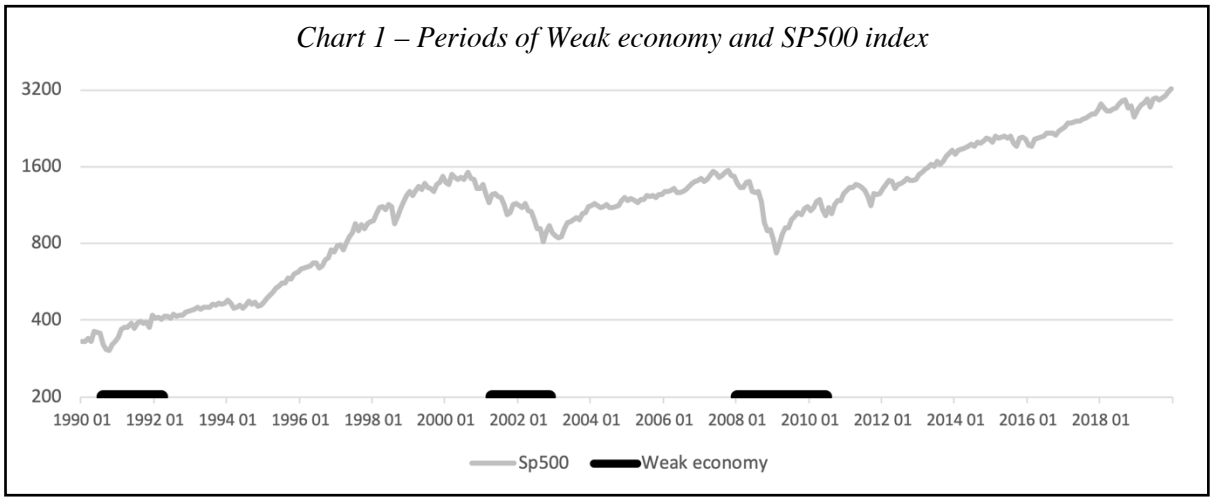
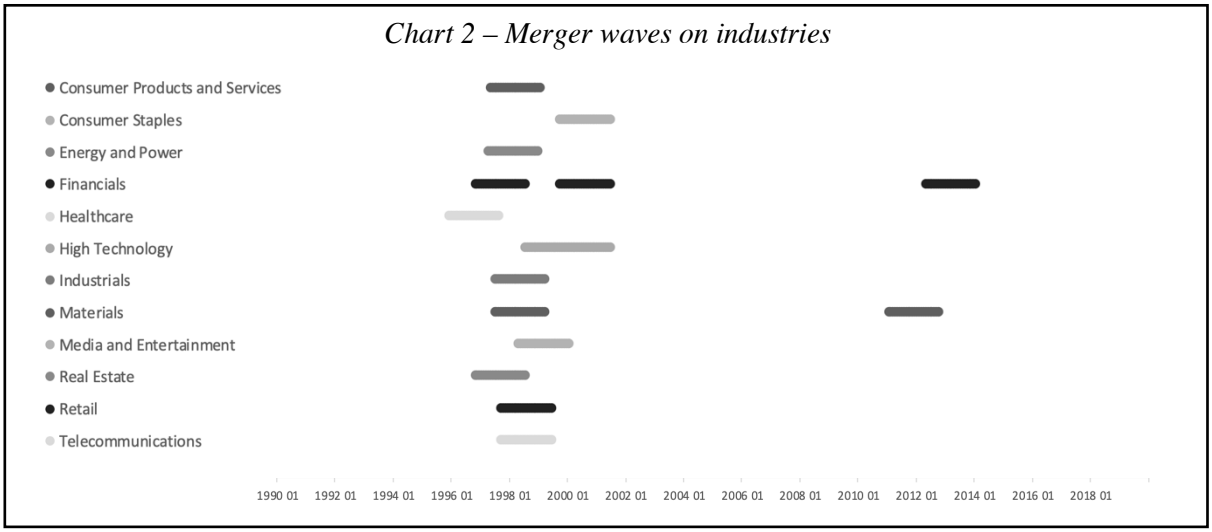



*Chart 2 – Merger waves on industries*

Chart 2 presents merger waves' timing on 12 industries. Industries are consistent with macro industry – definition in Thompson Reuters Eikon database. Industry definitions are presented in the left side of the chart and are organized in the same order, as the indicators of the industry specific merger waves.



# *4. Results*

## *4.1 Abnormal announcement returns*

The results of regressions of – 10 to +5 – day cumulative abnormal announcement returns (CARs) imply, that investors have reacted more negatively to merger announcements during weak economy. Coefficients of weak economy variable for acquiror's returns and for the combined returns are -0.022 and -0.030 respectively. Both coefficients are statistically significant. Target's returns are also affected negatively by weak economy, with a coefficient -0.030, which is significant only at 10% level. Results of regressions of – 10 to +5 – day announcement returns are presented in *Table 3*.

However, results of the entire announcement period's returns – regressions do not reveal statistically significant differences in returns caused by weak economy. The differing results of -10 +5 – day event window's and the entire announcement period's regressions may be caused by inaccurate market model coefficients that are used to determine the abnormal returns, and which are expected have larger impact on the longer timeframe. Indeed, the results of investor's immediate reaction during -10 to +5 – day event window are robust under most robustness tests, as shown in *section 5*, but no conclusions of weak economy's effect on the entire announcement period's returns can be made. Results of regressions of the entire announcement period's returns are presented in *Table 4*.

In my sample, mergers occurring during merger waves do not experience significantly different announcement returns compared to the mergers occurring outside of waves. During -10 +5 – day announcement window, tender offers yield higher acquiror -, target - and combined returns at 5% significance level. This result is consistent with several earlier studies (e.g. Servaes (1991)). During the entire announcement period the results are similar, but only target's Tender offer – coefficient is significant at 5% level. Target's relative size compared to the acquiror affect the target's returns negatively during both timeframes. The result is reasonable; the larger the target is compared to the acquiror, the less likely the acquiror is to pay large premiums for the target. Servaes (1991) comes to the same conclusion.

Consistent with most studies, average abnormal announcement returns for Acquirors are negative, whereas targets gain significantly, and the combined returns are slightly positive. In the entire sample, acquirors' average CAR for -10 to + 5-day announcement window is -0.021, targets' 0.192 and the combined CAR is 0.032.[2] Servaes (1991) documents almost identical announcement returns, as he reports CARs of -0.011, 0.236 and 0.037 for acquirors, targets and their combinations, respectively.

2) Average -10 +5-day announcement period CARs for acquirors, targets and their combination are significantly different from zero at 0.1% significance level. See Appendix 1 for more information.

Mergers announced during weak economy and during merger waves yield by far the lowest average CARs for both participants and for the combination of the participants. However, due to the small sample size of weak economy – on wave mergers, this result is not statistically significant, as shown in *Appendix 1*, where the significance of differences in average cross-sectional announcement period CARs are examined. Average CARs of the – 10 to + 5 – day announcement window are presented in Table 2.

*Table 2 – Cross sectional announcement period CARs*

Table 2 presents average cumulative abnormal returns (CARs) of -10 to +5-day announcement window, categorized to weak or normal/strong economy and to mergers occurring during merger waves or outside of these waves. Marginal 1 is the marginal distribution, where the division of economy is ignored, and marginal 2 is the marginal distribution, where the division to on wave and out of wave mergers is ignored. CARs for the entire sample are presented in the bottom right corner, and n is the number of deals in each category.

| *Table 2 - Cross sectional announcement period CARs* | | | | |
|---|---|---|---|---|
| | Participant | Weak economy | Normal/Strong economy | **Marginal 1** |
| On wave | Acquiror | -0.075 | -0.019 | **-0.022** |
| | Target | 0.111 | 0.205 | **0.200** |
| | Combined | -0.029 | 0.036 | **0.032** |
| | Number of mergers | n = 12 | n = 196 | **n = 208** |
| Off wave | Acquiror | -0.034 | -0.018 | **-0.020** |
| | Target | 0.178 | 0.192 | **0.190** |
| | Combined | 0.011 | 0.035 | **0.031** |
| | Number of mergers | n = 125 | n = 681 | **n = 806** |
| **Marginal 2** | **Acquiror** | **-0.038** | **-0.018** | **-0.021** |
| | **Target** | **0.172** | **0.195** | **0.192** |
| | **Combined** | **0.007** | **0.035** | **0.032** |
| | **Number of mergers** | **n = 137** | **n = 877** | **N = 1014** |

*Tables 3 and 4 – Results of announcement period regressions*

Tables 3 and 4 present coefficients of regressions, where the dependent variables are cumulative abnormal returns (CARs) of -10 to +5 – day event window, and CARs of the entire announcement period, respectively. CARs for acquirors and targets are accumulated from the prediction errors of their single factor market models. Combined CAR's are weighted averages of the target's and the acquiror's CAR's. Regressions are estimated as follows:

$$CAR = \alpha + \beta_1(Weak\ economy\ dummy) + \beta_2(Merger\ wave\ dummy) + \beta_3(Tender\ offer\ dummy) + \beta_4(Relative\ size),$$

where weak economy dummy equals 1 if the merger is announced during period of weak economy; merger wave dummy equals 1 if the merger is announced during a merger wave; tender offer dummy equals 1 if the form of the deal is tender offer; relative size is the market value of the target divided by the market value of the acquiror.

Correlations between the explanatory variables are low, and thus multicollinearity does not cause problems. The highest absolute correlation is a correlation of -0.115 between the weak economy – and merger wave variables. All other absolute correlations between the explanatory variables are smaller than 0.05.

Significance codes of coefficients: ( . ) significant at 10% level; ( * ) significant at 5% level; ( ** ) significant at 1% level; ( *** ) significant at 0.1% level.

Table 3 - Regression coefficients: Announcement period -10 +5 - day event window

| | Acquiror | | Target | | Combined | |
|---|---|---|---|---|---|---|
| | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value |
| Intercept ($\alpha$) | -0.0150 | 0.0145 * | 0.2101 | 2e-16 *** | 0.0173 | 0.0040 ** |
| Weak economy ($\beta_1$) | -0.0219 | 0.0492 * | -0.0295 | 0.100 . | -0.0296 | 0.0067 ** |
| Merger wave ($\beta_2$) | -0.0025 | 0.7940 | 0.0130 | 0.394 | -0.0017 | 0.8550 |
| Tender offer ($\beta_3$) | 0.0303 | 0.0160 * | 0.1420 | 4.5e-12 *** | 0.0508 | 4.0e-5 *** |
| Relative size ($\beta_4$) | -0.0114 | 0.1604 | -0.0668 | 4.2e-7 *** | 0.0288 | 0.0003 *** |

Table 4 - Regression coefficients: Entire announcement period

| | Acquiror | | Target | | Combined | |
|---|---|---|---|---|---|---|
| | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value |
| Intercept ($\alpha$) | -0.0152 | 0.271 | 0.2306 | 2e-16 *** | 0.0204 | 0.1295 |
| Weak economy ($\beta_1$) | -0.0090 | 0.719 | -0.0045 | 0.8852 | -0.0084 | 0.7308 |
| Merger wave ($\beta_2$) | 0.0017 | 0.938 | 0.0481 | 0.0691 . | 0.0090 | 0.6612 |
| Tender offer ($\beta_3$) | 0.0276 | 0.329 | 0.1312 | 0.0002 *** | 0.0046 | 0.0976 . |
| Relative size ($\beta_4$) | -0.0141 | 0.440 | -0.0844 | 0.0002 *** | 0.0246 | 0.1671 |

## *4.2 Abnormal three-year returns*

Three-year buy-and-hold abnormal returns (BHAR) show significantly weaker post-merger performance of acquisitions announced during weak economy. Regression coefficient for weak economy variable is -0.29, which is significant at 1% level. Consistent to earlier studies (e.g Duchin and Schmidt (2013)) merger waves' contribution to BHAR is negative with a coefficient of -0.19, which is significant at 5% level. Unlike to abnormal announcement returns, tender offer – and relative size – variables do not have statistically significant effects on post – merger BHAR. Three-year post-merger BHAR regression's coefficients are presented in *Table 6*. As Viswanathan and Wei (2008) show, BHAR is a downwards biased measure, and thereby it should not be used as an absolute measure of merging companies' performance, but only in comparison of those companies.

Post-merger performance measured with average BHARs is strongest for mergers that are announced outside of merger waves and not during weak economy, whereas mergers announced during merger waves and during weak economy experience by far the weakest post-merger performance. Number of mergers occurring during weak economy and on wave is significantly low[3], only 13 mergers of the sample of 1183, which is expected due to the procyclicality of merger waves. Notwithstanding the low number of on wave – weak economy – mergers, their average performance is weaker than mergers' in other categories at 1% significance level, as shown in *Appendix 2*. Average cross sectional BHARs are consistent with the regression results. Cross sectional BHARs are presented in *Table 5*.

*Table 5 – Cross sectional BHARs*

Table 5 presents average three-year post-merger buy-and-hold abnormal returns (BHARs) categorized to weak or normal/strong economy and to mergers occurring during merger waves or outside of these waves. Marginal 1 is the marginal distribution, where the division of economy is ignored, and marginal 2 is the marginal distribution, where the division to on wave and to off wave mergers is ignored. BHAR for the entire sample is presented in the bottom right corner. n is the number of deals in each category.

| *Table 5 - Cross sectional BHARs* | | | |
|---|---|---|---|
| | Weak economy | Normal/strong economy | Marginal 1 |
| On wave | **-0.834**<br>n = 13 | **-0.265**<br>n = 283 | **-0.290**<br>n = 296 |
| Off wave | **-0.354**<br>n = 138 | **-0.093**<br>n = 749 | **-0.134**<br>n = 887 |
| Marginal 2 | **-0.396**<br>n = 151 | **-0.140**<br>n = 1032 | **-0.173**<br>N = 1183 |

3) Relative frequencies of on wave – mergers are lower during weak economy at ~ 0% significance level, as shown in Appendix 3.

*Table 6– Results of three-year post-merger BHAR regression*

Table 6 presents coefficients of regression, where the dependent variable is three-year post-merger buy-and-hold abnormal returns of the acquiring companies. BHAR for individual company is the company's cumulative returns during the three-year post-merger period, less the benchmark's cumulative returns for the same period. Kenneth French's 48 industry portfolios (French (2020)) are used as the benchmarks. Regressions are estimated as follows:

$$BHAR = \alpha + \beta_1(Weak\ economy\ dummy) + \beta_2(Merger\ wave\ dummy) + \beta_3(Tender\ offer\ dummy) + \beta_4(Relative\ size),$$

where weak economy dummy equals 1 if the merger is announced during period of weak economy; merger wave dummy equals 1 if the merger is announced during a merger wave; tender offer dummy equals 1 if the form of the deal is tender offer; relative size is the market value of the target divided by the market value of the acquiror.

Correlations between the explanatory variables are low, and thus multicollinearity does not cause problems. The highest absolute correlation is a correlation of -0.145 between the weak economy – and merger wave variables. All other absolute correlations between the explanatory variables are smaller than 0.05.

| *Table 6 - Regression coefficients: 3-year BHAR* | | |
|---|---|---|
| | Coefficient | P-value |
| Intercept ($\alpha$) | -0.0864 | 0.1041 |
| Weak economy ($\beta_1$) | -0.2891 | 0.0047 ** |
| Merger wave ($\beta_2$) | -0.1899 | 0.0159 * |
| Tender offer ($\beta_3$) | -0.0508 | 0.6357 |
| Relative size ($\beta_4$) | 0.0078 | 0.8991 |

Significance codes of coefficients:

( . ) significant at 10% level
( * ) significant at 5% level
( ** ) significant at 1% level
( *** ) significant at 0.1% level.

Decomposition of BHAR shows, how the weak post-merger abnormal performance of weak economy – mergers is due to the strong performance of the merging companies' benchmark portfolios. The average cumulative 3-year gross return of companies merging during weak economy is 0.337, which is higher than the gross returns of companies merging during normal or strong economy, but as the benchmarks yield on average a return of 0.733, the average BHAR of weak economy mergers is considerably negative. This can be explained with the high market growth periods often following the weak economical periods, as can be seen in comparison of period of weak economy and SP500 index, presented in *Chart 1*. Thereby, on average the companies that are acquirors in weak economy mergers do not yield especially weak post-merger gross-returns, but on the other hand they appear to perform significantly worse compared to their industries[4]. BHAR decomposition is presented in *Table 7*.

Closer examination of measured BHARs supports the methodology and increases confidence in the results. *In Chart 3*, BHAR is presented for each month of the 3-year period. The chart demonstrates, how BHAR decreases at the fastest rate during the first months after the merger's completion. After 24 months, the decrease is insignificant[5], and BHAR appears to be stabilized. Thus, it is credible to claim

4) This should be taken with a slight reservation, since Viswanathan and Wei (2008) show that BHAR is a downwards biased measure.
5) Significance of BHARs rate of change is analysed in Appendix 2.

that the negativity of BHARs is at least to some extent a result of the weakened performance of merging companies, instead of unsuitable benchmarks or methodology, since the rate of BHAR's decrease decreases as time after the merger passes.

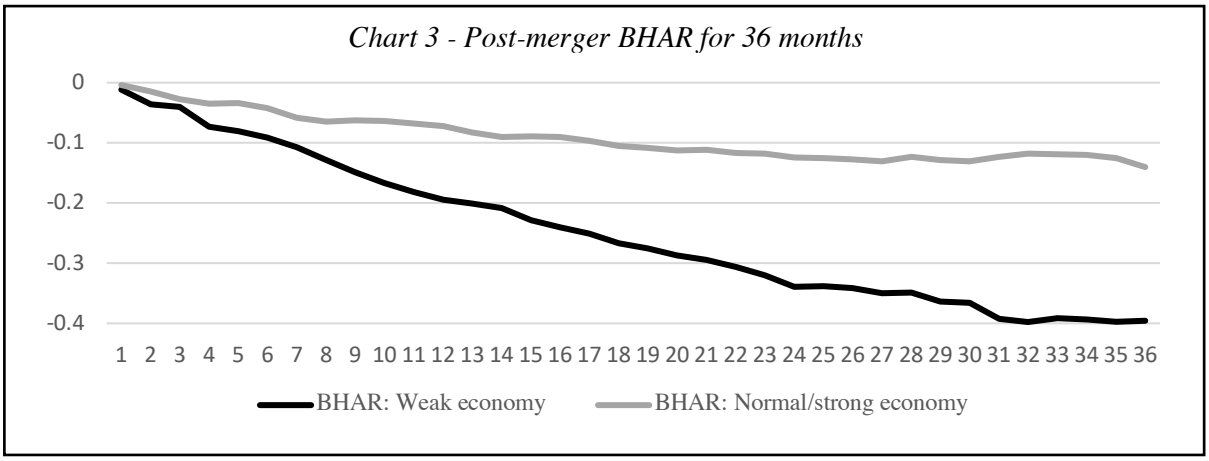
*Table 7 – BHAR decomposition*

Average cumulative three-year post-merger returns ($R_{AVG}$) for merging companies and for their benchmarks are presented in Table 7. Average BHAR is $R_{AVG}$ of benchmarks subtracted from $R_{AVG}$ of the merging companies.

| *Table 7 – BHAR decomposition* | | | | | |
|---|---|---|---|---|---|
| | Full sample | Weak economy | Normal/strong economy | On wave | Off wave |
| $R_{AVG}$ Merging companies | 0.167 | 0.337 | 0.142 | -0.111 | 0.259 |
| $R_{AVG}$ Benchmarks | 0.339 | 0.733 | 0.282 | 0.178 | 0.393 |
| **Average BHAR** | **-0.173** | **-0.396** | **-0.140** | **-0.290** | **-0.134** |
| Number of mergers | 1183 | 151 | 1032 | 296 | 887 |

*Chart 3 – Post-merger BHAR for 36 months*

Chart 3 presents monthly post-merger BHARs for companies that are acquirors in weak – and in normal/strong economy mergers. Month 0 is the month the merger is completed, and the target is delisted. Monthly BHAR is calculated for each month *t* and separately for the weak- and normal/strong – economy mergers as follows: $BHAR_t = \frac{\sum_1^i \prod_1^t (1+R_{i,t})}{n_t} - \frac{\sum_1^i \prod_1^t (1+R_{Benchmark\ i,t})}{n_t}$, where *i* is the company, $n_t$ is the number of companies in the sample during month *t*, $R_{i,t}$ is return of the company form month *t* and $R_{Benchmark\ i,t}$ is the return of company *i's* benchmark for month *t*.



## *4.3 Hypothesis and the negative effect of weak economy*

Results of considerably weaker announcement period - and 3-year post-merger abnormal returns of companies merging during weak economy provide strong evidence against *Hypothesis 0 - Weak economy does not have an effect on the abnormal merger gains*. The results support *H1b*: *Mergers initiated during weak economy underperform other mergers*, as the weak economic stage during announcement has negative effect on post-merger returns and announcement period returns of the merging companies. Especially weak economy's negative effect on BHAR appears to be a very robust result, as it remains significant in vast majority of the robustness checks. The weaker performance of mergers during weak economy could be a result of larger share of forced mergers, as Rhodes-Kropf and Viswanathan (2004) show how market undervaluation halts even economically justified mergers, and Harford (2005) links high capital liquidity to increased merger activity. Periods of weak economy are characterized by high uncertainty, low equity valuations and low liquidity, rather than high liquidity and equity overvaluation. Therefore, a majority of mergers occur during normal or strong economy, and not during weak economic stages. Thus, it is reasonable to assume that a large part of mergers announced during weak economy, are in fact forced mergers, and yield weaker returns since they are not necessarily economically justified and do not produce significant synergies.

Even though there is strong evidence against *H1a: Mergers initiated during weak economy outperform other mergers*, the hypothesized factors supporting H1a are not necessarily untrue. It is feasible that hubris, CEO overconfidence and managerial herding are value destructive and more likely to occur during normal or strong economy than during weak economy. However, these factors appear to have smaller effect than the factors affecting merger performance negatively. As the managerial behavioral problems are linked in earlier studies primarily to periods of especially high merger activity, it is likely that the merger wave control variable absorbs their effect. Indeed, if the regressions are re-estimated with weak economy variable as the only explanatory variable, the weak economy – coefficients are less negative, while still significant.

Weak economy's negative and statistically significant coefficient in -10 to +5-day announcement window regression of acquiror's returns suggests that at the time of announcement investors partly recognize the weaker post-merger performance of weak economy - acquirors. Also targets of weak economy mergers receive lower abnormal returns during the announcement window at 10% significance level, which could support Hypothesis 1b and the idea of larger share of forced mergers during weak economy. Indeed, targets of on wave mergers gain slightly larger announcement returns, even though not statistically significantly, than targets of out of wave mergers, whilst also on wave mergers underperform out of wave mergers during the three-year post-merger period. Thereby, it could be that the targets of weak economy – mergers might settle for lower premiums, if these mergers indeed

are done by necessity and not by choice, which does not seem to be the case with on wave mergers. However, this result of lower announcement returns of targets could also be due to lower number of potential acquirors during weak economy.

BHAR decomposition of *Table 7* shows how weak economy mergers yield higher gross returns than mergers announced during normal or strong economy, but the extremely strong performance of the benchmarks of weak economy mergers lead to significantly weaker abnormal performance of weak economy mergers. If a majority of weak economy mergers are indeed forced mergers, this result is reasonable; The companies do not produce negative returns, but due to potential financial difficulties and economically unjustified mergers, their after-merger performance cannot keep up with their benchmarks. However, this would imply that the investors did not entirely recognize the difficulties the merging companies had pre-merger and that caused them to merge. Additionally, this would not mean that the weak economy mergers were value destructive, as it is not possible to compare the after-merger performance to the performance of the companies if the merger had not had happened.

This study replicates several results of other studies. These are merger waves' detrimental effect on post-merger returns, tender offers' positive effect on announcement returns, acquirors' slightly negative announcement returns, and slightly positive combined announcement returns of acquirors and targets. Consistent secondary results compared to the majority of earlier studies increase confidence in the results considering returns of weak economy mergers. As weak economy's effect on announcement- and post-merger returns also remains negative and statistically significant in most of the robustness tests, it can be concluded with a high confidence, that on average mergers announced during weak economy yield lower abnormal returns than mergers announced during good or normal economy.

## *5. Robustness of the results*

I test robustness of my results by re-estimating the regressions for samples, where some of the deals are excluded. The primary results remain robust under majority of these tests. CARs for entire announcement period are not examined in robustness tests, but announcement returns mentioned in this section are the -10 +5 – day abnormal announcement returns. In the first robustness test, I remove the deals announced between 1998 and 2001. In the second test, I apply all data – and deal requirements used in the original announcement period performance – and post-merger performance test for the sample used with both time frames. In the third test, deals which are placed in the lowest decile of combined abnormal announcement returns are excluded. In the fourth test, I exclude the deals with the weakest post-merger performance, and fifth, I re-estimate the regressions for sub-samples where the examined 30-year period is divided into three shorter periods.

Moeller et. al (2005) point out that acquirors' negative announcement returns during 1990's and early 2000's is a result of large-loss deals between 1998 and 2001. From 1990 to 1997 abnormal announcement returns for acquirors are in fact positive. Thereby, for robustness test 1, I exclude all mergers announced between 1998 and 2001 from my sample. This reduces my announcement period sample size to 784 mergers, of which 103 occur during weak economy and 65 during merger waves. Here weak economy - regression coefficients for acquiror's and combined returns are still negative and statistically significant. Targets' weak economy coefficient is no longer significant at 10% level, but it also remains negative. Results considering tender offers' and relative sizes' coefficients remains for most part unchanged. Average announcement period CARs for all participants remain similar and significantly different form 0. Sample size for 3-year BHAR – tests is reduced to 881 mergers of which 116 occur during weak economy and 107 during merger waves. Weak economy's contribution to 3-year BHAR remains negative and significant, even though the average BHAR for the used sample is less negative at -0.13, while it is -0.17 for the original sample. Merger waves' coefficient in 3-year BHAR regression is negative, but no longer statistically significant, which is expected as number of on wave mergers is reduced to 107 from the original number of 296.

In robustness test 2, in order to test if my results considering abnormal announcement returns and abnormal three-year post-merger returns can be combined, I re-estimate regressions for a unified sample, where all requirements for announcement period tests and for post-merger tests are applied for the sample. Here the sample size is 889 mergers of which 135 occur during weak economy and 198 on merger waves. The results of original tests remain robust with a difference that targets weak economy - coefficient in announcement period regression is now significantly negative at 5% level, whereas it was originally significant only at 10% level. Thereby, it is safe to make conclusions combining the results of announcement period CARs and 3-year BHARs.

In robustness test 3A, I remove the first decile of deals based on their combined announcement period returns from the sample used in test 2, because Moeller et. al (2005) point out that the companies making deals with large losses during announcement period, yield weaker post-merger returns. Essentially, this means excluding deals with combined abnormal announcement returns lower than -0.094, and results a sample of 800 deals of which 114 occur during weak economy and 176 on merger waves. The sample of test 3, where the weakest decile of deals is removed gives higher average announcement CARs for all participants, as expected. Here acquirors' average announcement period CAR is positive at 0.003, which however is not significantly different from 0. Weak economy coefficients of announcement period CAR regressions are still negative, but not statistically significant. This suggests that the weaker announcement CARs for weak economy mergers are partly driven by large loss deals, but as robustness test 1 reveals, this is not due to the exceptional situation on equity markets between 1998 and 2001.

However, in three-year BHAR regression, weak economy coefficient remains negative and statistically significant. Merger wave coefficient also remains negative but is significant only at 10% level.

To further test the effect large losses during announcement period has on post-merger performance, in robustness test 3B, I re-estimate regression coefficients for the sample used in test 2, by using combined announcement returns as an explanatory variable for 3-year BHARs. The announcement return variable has a positive regression coefficient, which is not significant. Original results of significantly negative weak economy – and merger wave – variables remain significant even when the announcement returns are used as a control variable.

Fourth robustness test reveals, that weak economy's effect on post-merger BHARs is not due to negative outliers, but rather the effect is visible through the entire sample. Deciles of BHARs of weak economy mergers are consistently weaker than the BHAR deciles of mergers during normal or strong economy. Additionally, I re-estimate the BHAR regression with a sample where the deals placed in the lowest quartile based on their BHARs is removed separately from weak economy – and normal/strong economy samples. For this sample, the results of weak economy's detrimental effect remain consistent to the original results and significant at 5% level. Thereby, weak economy's effect appears to be significant for a large part of the deals.

In the fifth test, I create three sub-samples including mergers announced during periods 1990-1999, 2000-2007 and 2008-2019. Each sample includes one period of weak economy, and thus the test reveals if weak economy merger's performance is consistently weaker in each period. Weak economy's BHAR regression coefficient is negative in all of the sub-samples, but it is statistically significant (at 0.1% level) only during the second subsample of years 2000-2007, whereas in first sample the coefficient is significant only at 10% level, and in the third sample the coefficient is insignificant. In announcement period -10 + 5 – day CAR regressions the weak economy coefficients for the combined CARs are negative in the second and third sub-samples at 10% and 5% significance levels, whereas in the first sub-sample the coefficient is insignificantly positive. Even though the significance levels are lower, and the results are not as conclusive than with the entire sample, the observed effect appears to be present at least in some magnitude during different periods of weak economy.

# *6. Limitations and future research*

Based on my results, it can be said with a high confidence, that US to US mergers of public companies between 1990 and 2019 occurring during weak economy yield lower abnormal announcement - and 3-year post-merger returns, than mergers occurring during normal or good economy. However, even though larger share of forced mergers during weak economy is a very potential explanation for the weaker performance, this study does not provide conclusive evidence for that being the case. Indeed, there might be other explanations for the documented weak performance, that are yet not recognized. Additionally, this subject has not received extensive academic attention, and thereby there are no strictly similar studies published in major academic journals of finance, that could be used as comparison. Therefore, based on this study, no generalization of the results to other markets and time periods can be made with a high certainty.

In the used data and methods, there are three issues that should be taken into consideration. First, classification of weak economy can be done with several different methods. Here, the assumption of weak economic situation being the period from peak date to twelve months after the through date does not take into consideration the possible differences in the time economy takes to recover after different downward shocks. Additionally, the simplified classification to weak – and normal/strong – economy is not strictly realistic. Despite the issues, this method is chosen for simplicity and to diminish the risk of researcher biases that could occur if a more subjective method of classification were used. Second, general hypothesis of distribution of prediction errors in linear regressions are satisfied relatively well, as shown in *Appendix 5*. Even though, in the three – year BHAR regression model, there are a few substantially large outliers. However, removing these outliers from the regression do not change the regression coefficients significantly, and the results remain robust. Third, T-tests are used to determine if the CARs and BHARs are significantly different from 0, even as the T-test's general hypothesis of normally distributed observations is not satisfied. Still, as most of the examined samples are large, T-tests give fairly reliable results.

The documented negative effect weak economic situation during announcement period has on merger gains is a largely undocumented phenomenon, which gives room for future research. This subject could be researched in more depth in order to either replicate or challenge the results of this thesis with different samples and methods. The motives for weak economy mergers should be examined more carefully in order to determine the factors leading to the weakened post-merger performance.

# *7. Conclusions*

In this thesis, I establish a largely undocumented relationship between weak economic situation during merger announcement and weakened abnormal returns of the merging companies. Regression results for announcement returns, measured with cumulative abnormal returns, during -10 + 5-day announcement period show weak economy having a negative effect on the acquirors and the combined returns at 5% significance level. Targets' returns are also affected negatively but only at 10% significance level. Weak economy affects negatively also the abnormal returns during the entire announcement period, but these regression coefficients are not significant. The difference in the significance of the results may be due to the possibly inaccurate market betas that are expected to have a larger effect during the longer timeframe. Regression test of three-year post-merger abnormal returns measured with buy-and-hold abnormal returns (BHARs) show weak economy having a significant and negative effect on the post-merger performance. Especially the results of the BHAR regression are proven to be very robust under the robustness tests.

Null hypothesis of weak economy during the merger announcement not having an effect on abnormal merger gains is rejected. A potential reason for the negative effect, I document weak economy having on the abnormal returns of the merging companies, is that a large share of weak economy mergers would be forced mergers. This argument is supported by findings of Rhodes-Kropf and Viswanathan (2004) considering market undervaluation's tendency to halt also economically justified mergers, and the positive effect high liquidity has on merger activity documented by Harford (2005). Thereby, a large part of weak economy mergers may indeed be forced mergers that are done by necessity. This could explain the weaker performance of weak economy mergers, as Duchin and Schmidt (2013) reason that forced mergers are expected to yield lower returns than other mergers.

In this study, I also replicate results of earlier studies. I document mergers occurring during merger waves having a significantly weakened post-merger performance, and these waves being pro-cyclical. Furthermore, even though the on wave weak economy mergers are an exception, there appears to be a combined effect of merger waves and weak economy leading to the far worst announcement period – and post-merger performance in my sample. However, this result is driven by the mergers announced in late 2001's and due to the exceptional merger markets in the early 2000's this result may not be consistent over time. Other well-known phenomena replicated in this study are the slightly negative announcement returns of the acquirors, and significantly positive announcement returns of the targets. Additionally, tender offers' positive effect on the announcement returns of the targets and the acquirors, recognized by e.g Servaes (1991), is replicated.

Even though the weak economy's negative effect on merging companies' returns is statistically significant and remains robust under the majority of the robustness tests, this study does not provide conclusive evidence on the factors leading to the weakened performance. A large share of mergers occurring during weak economy being forced mergers is a potential explanation for the results, but there may be other explanations for the phenomenon that are not yet recognized. However, the in-depth examination of the factors resulting the weakened performance is outside of the scope of this study. As the documented effect of weak economy is previously largely unrecognized, future research aiming to generalization of the results and closer examination of the reasons leading to it, is called for.

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# *Appendices*

## *Appendix 1 – Analysis of average -10+5 - day announcement period CARs*

Average -10 +5 - day announcement period CARs for acquirors, targets and their combinations are -0.021, -0.192 and 0.032, respectively. Each participants' average CARs are different from zero at 0.1% significance level. Significance of the average CARs is tested with T-tests, and even though T-test's general hypothesis of normally distributed observations is not satisfied[6], due to the large sample the results are relatively valid. The test is conducted as follows:

$T = \frac{\overline{CAR_i}}{\frac{\sigma_i}{\sqrt{n_i}}}$, where $\overline{CAR_i}$ is the average CAR for participant $i$, $\sigma_i$ is the standard deviation of CARs of participant $i$ and $n_i$ is the number of deals. As $n_i$ large, at 1014, *T~N(0,1)*. Thereby, P-values for the tests can be estimated based on cumulative normal distribution. Results of the T-tests are presented in *Table 8*. Code *** represents significance at 0.1% level.

*Table 8: T-test of average CARs*

| | Acquiror | Target | Cobined |
|---|---|---|---|
| Avg | -0.0207 | 0.1921 | 0.0316 |
| n | 1014 | 1014 | 1014 |
| sd | 0.1206 | 0.2014 | 0.1196 |
| t-stat | -5.47 | 30.38 | 8.40 |
| P-value | 2.272E-08 | 0.000E+00 | 0.000E+00 |
| Significance | *** | *** | *** |

Additionally, I test the significance of differences between the cross-sectional CARs presented in section 4.1 in Table 2. The differences are tested with Welch's T-tests. Average -10+5-day announcement period CARs between On- and Off-wave mergers do not differ significantly from each other in any of the economic stages. However, average combined CARs between weak economy mergers and normal/strong economy mergers do differ at 5% significance level in off – wave sample and in the entire sample. In on-wave sample the difference is considerable, but not significant due to the extremely small sample of weak economy on-wave mergers. These results are consistent with the regression results of -10 + 5 – day announcement returns; Merger waves do not have significant effect on announcement CARs, whereas economic stage has a significant effect. There are signals of combined negative effect of weak economy and merger waves, but due to the rarity of these mergers, the result is not statistically significant.

6) Normality of CARs' distribution is tested with $\chi^2$-distribution test. CARs are not normally distributed. Visual review of histogram of the distribution shows that CARs' distribution resembles normal distribution, but the null hypothesis of normality is rejected mainly due to relatively high probability of high and low CARs.

## *Appendix 2 – Analysis of average BHARs*

Average cross sectional three-year post-merger BHARs are significantly different from each other at 1% levels. I test the significance with Welch's T-tests. Test's general hypothesis of normally distributed BHARs is not satisfied[7], but as majority of the samples are large, the results are reasonable valid. However, the results of significance of on wave – weak economy – mergers should be taken with a slight reservation due to the small sample of 13 mergers. Average BHARs and P-values are presented in *Table 9*. Row *P-values 1* presents P-values for difference of average BHARs of on wave and Off wave mergers in different economical stages. Column *P-values 2* presents P-values for difference of average BHARs of mergers during weak economy and during normal/strong economy, in on wave and Off wave samples.

Significance codes of the T-tests: ( ** ) significant at 1% level; ( *** ) significant at 0.1% level.

| Table 9 - Cross sectional BHARs an P-values | | | | |
|---|---|---|---|---|
| | Weak economy | P-values 2 | Normal/strong economy | Marginal |
| On wave | **-0.834**<br>n = 13 | P-value: BHARs of On wave -mergers are not same during Weak economy and Normal/strong economy<br>0.0014 ** | **-0.265**<br>n = 283 | **-0.290**<br>n = 296 |
| P-values 1 | P-value: BHARs of On wave and Off wave mergers are not same during Weak economy<br>0.0053 ** | | P-value: BHARs of On wave and Off wave mergers are not same during Normal/strong economy<br>0.0025 ** | P-value: BHARs of On wave and Off wave mergers are not same<br>0.0027 ** |
| Off wave | **-0.354**<br>n = 138 | P-value: BHARs of Off wave -mergers are not same during Weak economy and Normal/strong economy<br>0.0020 ** | **-0.093**<br>n = 749 | **-0.134**<br>n = 887 |
| Marginal | **-0.396**<br>n = 151 | P-value: BHARs of mergers are not same during Weak economy and Normal/strong economy<br>0.0008 *** | **-0.140**<br>n = 1032 | **-0.173**<br>N = 1183 |

7) Normality of BHARs' distribution is tested with $\chi^2$-distribution test. BHARs are not normally distributed. Visual review of histogram of the distribution shows that BHARs' distribution resembles normal distribution, but the null hypothesis of normality is rejected mainly due to relatively high probability of high and low BHARs.

The results of significant differences between average BHARs of each category is consistent with results of the three-year BHAR regression; Weak economic stage and merger wave during the merger announcement are both related to weaker after-merger performance. These differences remain consistent when the sample is divided into the four categories of *Table 9*, and the performance of on wave – weak economy – mergers is significantly worst of the performances of the categories, as expected based on the regression results.

In section 4.2 Chart 3, I present BHARs for 36 months after completion of mergers. BHAR appears to first decrease rapidly, and to stabilize after 24 months. I examine average BHARs during 3-month periods in order to test this appearing stabilization. Indeed, in each 3-month period 0 to 24 months after merger, average 3-month BHARs of the companies are negative and significant at 5% level. From month 24 to month 36, all average 3-month BHARs are insignificant. This result increases BHAR's credibility as a measure of mergers' effect on post-merger returns, because the mergers' effect appears to be first at its strongest, and then gradually weaker, and finally insignificant. The three-month mergers and their significance levels are presented in *Table 10*.

*Table 10 – Average 3-month BHARs*

Table 10 presents the average 3-month BHARs for the 3-year post-merger period. Average 3-month BHARs are calculated as follows. 3-month BHAR, for company *i* for 3-month period ending at month *t* is:

$3-month\ BHAR_{i,t} = \frac{\prod_{t=0}^{t} 1+r_{i,t}}{\prod_{t=0}^{t-3} 1+r_{i,t}} - \frac{\prod_{t=0}^{t} 1+r_{Bencmark_{i,t}}}{\prod_{t=0}^{t-3} 1+r_{Bencmark_{i,t}}}$ , where $r_{i,t}$ is return for company *i* in month *t*, and $r_{Bencmark_{i,t}}$ is return for company *i's* benchmark industry in month *t*.

Average 3-month BHAR is simple average of company specific BHARs of companies that have remained publicly listed at the 3-month period in question. Significance codes for the average BHAR being unequal to zero are the following:

( . ) significant at 10% level; ( * ) significant at 5% level; ( ** ) significant at 1% level; ( *** ) significant at 0.1% level.

| Table 10 - Average 3-month BHARs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Months after | 0 - 3 | 3 - 6 | 6 - 9 | 9 - 12 | 12 - 15 | 15 - 18 | 18 - 21 | 21 - 24 | 24 - 27 | 27 - 30 | 30 - 33 | 33 - 36 |
| Average BHAR | -0.029 | -0.016 | -0.022 | -0.018 | -0.018 | -0.018 | -0.013 | -0.014 | -0.003 | -0.007 | 0.053 | -0.010 |
| n | 1183 | 1181 | 1180 | 1170 | 1156 | 1133 | 1117 | 1110 | 1093 | 1076 | 1055 | 1040 |
| $\sigma$ | 0.207 | 0.254 | 0.238 | 0.214 | 0.230 | 0.235 | 0.233 | 0.269 | 0.234 | 0.220 | 2.309 | 0.219 |
| T-stat | -4.907 | -2.110 | -3.116 | -2.803 | -2.710 | -2.632 | -1.867 | -1.692 | -0.471 | -1.089 | 0.739 | -1.412 |
| P-value | 0.0000 | 0.0175 | 0.0009 | 0.0026 | 0.0034 | 0.0043 | 0.0311 | 0.0455 | 0.3190 | 0.1382 | 0.2301 | 0.0792 |
| Significance | *** | * | *** | ** | ** | ** | * | * | | | | . |

## *Appendix 3 – Frequencies of on wave mergers*

In my sample, frequencies of on wave mergers are significantly higher during normal/strong economy than during weak economy. This result is consistent with the largely recognized procyclicality of merger waves. I test the relative frequencies of on-wave mergers with $\chi^2$- homogeneity test. I use the sample of the 3-year post-merger BHAR test. The null hypothesis of the test is homogenic distributions between rows and between columns. Actual observed frequencies of mergers in each category, and the expected frequencies based on the null hypothesis, are presented in *Table 11*.

*Table 11 - $\chi^2$-homogeneity test*

Observed frequencies

| | Weak economy | Normal/strong economy | Marginal 2 |
|---|---|---|---|
| On wave | 13 | 283 | 296 |
| Off wave | 138 | 749 | 887 |
| Marginal 1 | 151 | 1032 | 1183 |

Expected frequencies

| | Weak economy | Normal/strong economy | Marginal 2 |
|---|---|---|---|
| On wave | 37.78 | 258.22 | 296 |
| Off wave | 113.22 | 773.78 | 887 |
| Marginal 1 | 151 | 1032 | 1183 |

$\chi^2 - test\ value = \sum_i \frac{(F_{O_i} - F_{E_i})^2}{F_{E_i}}$ ,

where $i$ is the category, $F_{O_i}$ is the observed frequency in the category, and $F_{E_i}$ is the expected frequency in the category.

Now $\chi^2 \approx 24.85$, and the null hypothesis can be rejected at 0.1% level.

## *Appendix 4 - Regression results for the robustness tests*

In this section, I present regression tables for the robustness tests 1 to 4 introduced in *section 5.* Regressions in robustness tests are the forms:

$CAR = \alpha + \beta_1(Weak\ economy\ dummy) + \beta_2(Merger\ wave\ dummy) + \beta_3(Tender\ offer\ dummy) + \beta_4(Relative\ size)$

and

$BHAR = \alpha + \beta_1(Weak\ economy\ dummy) + \beta_2(Merger\ wave\ dummy) + \beta_3(Tender\ offer\ dummy) + \beta_4(Relative\ size)$

Significance codes for the regression coefficients are:

( . ) significant at 10% level; ( * ) significant at 5% level; ( ** ) significant at 1% level; ( *** ) significant at 0.1% level.

**Robustness test 1**

In robustness test 1, deals announced between 1998 and 2001 are removed from the original samples. Sample size for the announcement period test is 784 mergers, of which 103 occur during weak economy and 65 during merger waves. 3-year BHAR-test's sample size is 881 mergers, of which 116 occur during weak economy and 107 during merger waves. Average CARs for all participants are different from zero at 0.1% significance level. 3-year BHAR is different from zero at 1% level. Averages are similar to the original sample.

*Table 12 - Robustness test 1: -10 +5 - day announcement window*

| | Acquiror | | Target | | Combined | |
|---|---|---|---|---|---|---|
| | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value |
| Intercept | -0.0066 | 0.2914 | 0.2199 | 2e-16 *** | 0.0250 | 3.8e-5 ** |
| Weak economy | -0.0226 | 0.0496 * | -0.0245 | 0.190 | -0.0301 | 0.0065 ** |
| Merger wave | 0.0116 | 0.4105 | -0.0261 | 0.253 | 0.0011 | 0.9350 |
| Tender offer | 0.0204 | 0.1147 | 0.1256 | 3.0e-9 *** | 0.0392 | 0.0016 ** |
| Relative size | -0.0226 | 0.0138* | -0.0847 | 1.7e-8 *** | 0.0189 | 0.0315 * |

*Table 13 - Robustness test 1: 3-year BHAR*

| | Coefficient | P-value |
|---|---|---|
| Intercept | -0.0646 | 0.3154 |
| Weak economy | -0.2690 | 0.0356 * |
| Merger wave | -0.1617 | 0.2217 |
| Tender offer | -0.1036 | 0.4449 |
| Relative size | 0.0067 | 0.9308 |

**Robustness test 2**

In robustness check 2, all requirements for announcement period tests and for post-merger tests are applied for the sample used in both tests. Here the sample size is 889 mergers, of which 135 occur during weak economy and 198 occur during merger waves. Average CARs for all participants and average 3-year BHAR are similar to the averages of the original sample and are all significantly different from zero at 0.1% level.

*Table 14 - Robustness test 2: -10 +5 - day event window*

| | Acquiror | | Target | | Combined | |
|---|---|---|---|---|---|---|
| | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value |
| Intercept | -0.0128 | 0.0577 . | 0.2188 | 2e-16 *** | 0.0213 | 0.0012 ** |
| Weak economy | -0.0258 | 0.0262 * | -0.0377 | 0.0407 * | -0.0346 | 0.0023 ** |
| Merger wave | -0.0034 | 0.7333 | 0.0041 | 0.7930 | -0.0054 | 0.5844 |
| Tender offer | 0.0288 | 0.0321 * | 0.1309 | 1.2e-9 *** | 0.0449 | 0.0007 *** |
| Relative size | -0.0102 | 0.2328 | -0.0633 | 3.6e-6 *** | 0.0306 | 0.0003*** |

*Table 15 - Robustness test 2: 3-year BHAR*

| | Coefficient | P-value |
|---|---|---|
| Intercept | -0.0723 | 0.2975 |
| Weak economy | -0.2942 | 0.0141 * |
| Merger wave | -0.2318 | 0.0250 * |
| Tender offer | -0.1995 | 0.8855 |
| Relative size | 0.0251 | 0.7763 |

**Robustness test 3**

In robustness test 3A, the first decile of deals is removed based on their combined announcement period returns from the sample used in test 2. Here the sample size is 800 mergers, of which 114 occur during weak economy and 176 occur during merger waves. Average CAR of acquirors is here slightly positive, but not significant. Average targets' and combined CARs are both approximately 3% larger than in the original sample, and significant at 0.1% level. Average 3-Year BHAR, at -0.127, is less negative than in the original sample, but still significant at 1% level.

*Table 16 - Robustness test 3A: -10 +5 - day event window*

| | Acquiror | | Target | | Combined | |
|---|---|---|---|---|---|---|
| | Coefficient | P-value | Coefficient | P-value | Coefficient | P-value |
| Intercept | 0.0023 | 0.7069 | 0.2290 | 2e-16 *** | 0.0345 | 1.3e-9 *** |
| Weak economy | -0.0034 | 0.7546 | -0.0147 | 0.4364 | -0.0092 | 0.3630 |
| Merger wave | 0.0061 | 0.4975 | 0.0174 | 0.2753 | 0.0057 | 0.5024 |
| Tender offer | 0.0218 | 0.0673 . | 0.1236 | 5.3e-9 *** | 0.0374 | 0.0009 *** |
| Relative size | -0.0048 | 0.5351 | -0.0461 | 0.0007 *** | 0.0414 | 1.5e-8 *** |

*Table 17 - Robustness test 3A: 3-year BHAR*

| | Coefficient | P-value |
|---|---|---|
| Intercept | -0.0391 | 0.6021 |
| Weak economy | -0.2667 | 0.0472 * |
| Merger wave | -0.2203 | 0.0520 . |
| Tender offer | -0.0211 | 0.8877 |
| Relative size | 0.0015 | 0.9873 |

In robustness test 3B, the sample of test 2 is used for 3-year BHAR regression, and announcement period combined CAR is used as a control variable.

Table 18 - Robustness test 3B: 3-year BHAR, combined announcement returns as explanatory factor

| | Coefficient | P-value |
|---|---|---|
| Intercept | -0.0750 | 0.2830 |
| Weak economy | -0.2899 | 0.0162 * |
| Merger wave | -0.2311 | 0.0255 * |
| Tender offer | -0.0256 | 0.8544 |
| Relative size | 0.0212 | 0.8115 |
| Combined announcement returns | 0.1260 | 0.7227 |

**Robustness test 4**

In robustness test 4, I remove quartiles of worst post-merger performing weak economy – and normal economy mergers. The sample size for this test is 888 mergers, of which 114 occur during weak economy and 208 during merger waves. Test 4 is conducted only to post-merger BHARs. In table 19 are the regression results for the test, and in Table 20 are the deciles of BHARs of the original sample of the BHAR test. Deciles during weak economy are consistently lower than during normal or strong economy.

*Table 19 - Robustness test 4*

| | Coefficient | P-value |
|---|---|---|
| Intercept | 0.1630 | 0.0131 * |
| Weak economy | -0.2794 | 0.0232 * |
| Merger wave | -0.1812 | 0.0627 . |
| Tender offer | -0.0130 | 0.9214 |
| Relative size | 0.0297 | 0.7182 |

*Table 20: Deciles of BHARs of weak economy - and normal/strong economy mergers*

| Percentile | BHAR: weak economy | BHAR: normal economy |
|---|---|---|
| 0.1 | -1.282 | -0.976 |
| 0.2 | -0.995 | -0.663 |
| 0.3 | -0.792 | -0.488 |
| 0.4 | -0.621 | -0.367 |
| **Median** | **-0.480** | **-0.240** |
| 0.6 | -0.338 | -0.096 |
| 0.7 | -0.107 | 0.060 |
| 0.8 | 0.088 | 0.249 |
| 0.9 | 0.394 | 0.546 |

## *Appendix 5 - Distributions of regression model prediction errors*

General hypotheses for linear regressions are the following: Prediction errors should be uncorrelated, errors have standard variance, expected error is 0 and errors are not depended on the explanatory variables. In this section, I asses these requirements visually. There are no major conflicts between the general hypotheses and the observed distribution of prediction errors of neither, -10+5 -day CAR-model, nor BHAR-model. However, there is one significant outlier in BHAR-model[8]. Even though, removing this observation does not change the regression results significantly.

**-10+5-day CAR regression model prediction errors**

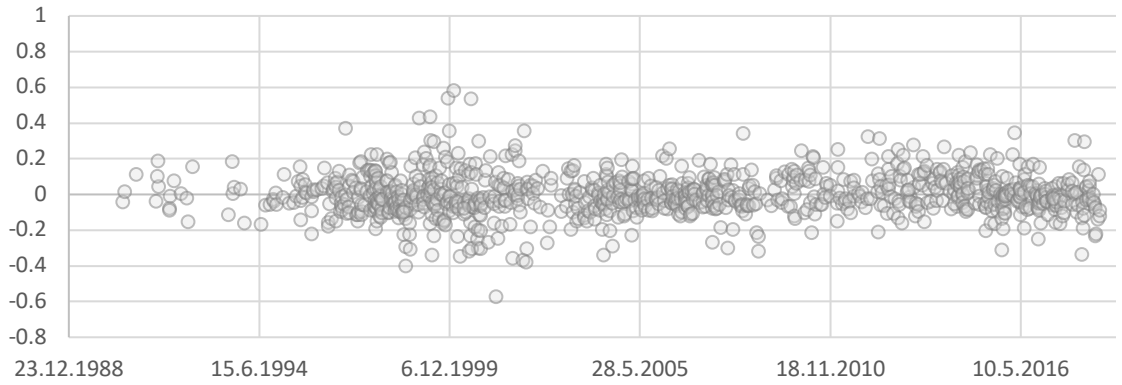
-10 + 5-day CAR – prediction model for company $i$ is as follows:

$$E_i(CAR) = \alpha + \beta_1(Weak\ economy\ dummy_i) + \beta_2(Merger\ wave\ dummy_i) + \beta_3(Tender\ offer\ dummy_i) + \beta_4(Relative\ size_i)$$
$$= -0.015 - 0.0219(Weak\ economy\ dummy_i) - 0.0025(Merger\ wave\ dummy_i) + 0.0303(Tender\ offer\ dummy_i) - 0.0114(Relative\ size_i)$$

CAR prediction error for company $i$ is $E_i(CAR) - CAR_i$.

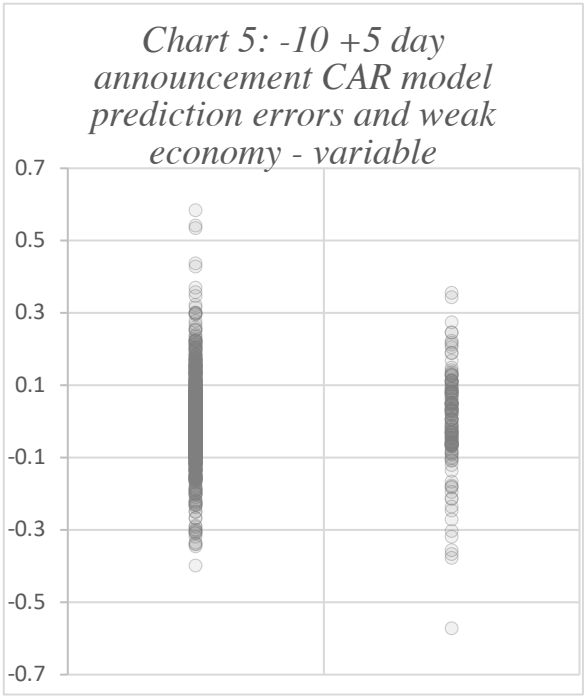
CAR prediction errors for -10+5-day announcement window are presented only for the combined CARs. However, errors of acquirors' and targets' returns are distributed very similar to the errors of combined returns. Errors for entire announcement period CAR -models are not presented.

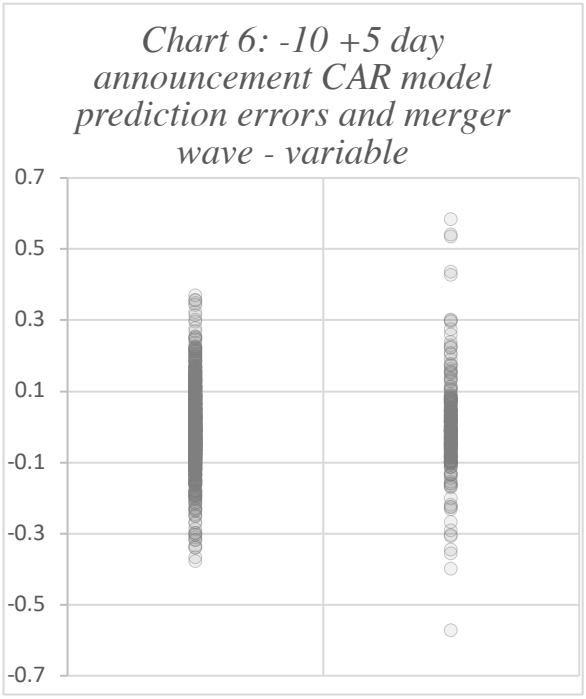
*Chart 4: -10 +5 day announcement CAR model prediction errors and time*



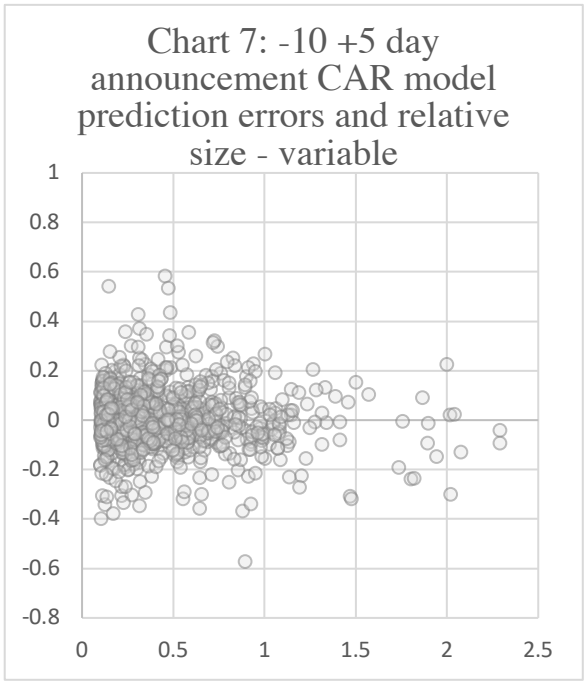

In Chart 4, horizontal axis is the announcement date of the merger. Vertical axis is the magnitude of the prediction error.

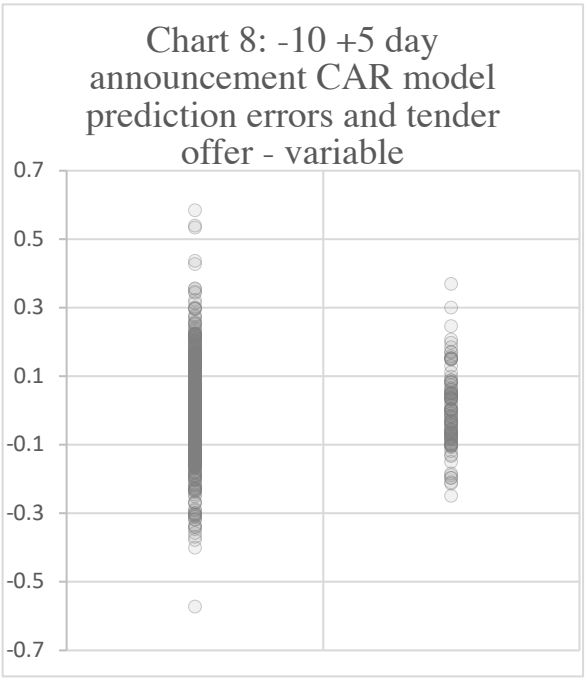
8) Outlier, error of approximately 30 in the BHAR – model, is not visible in the error – distribution charts.




In Chart 5, on the left side are the prediction errors during normal/strong economy, and on the right side the prediction errors during weak economy. In Chart 6, on the left side are the prediction errors off merger waves, and on the right side, prediction errors on merger waves.



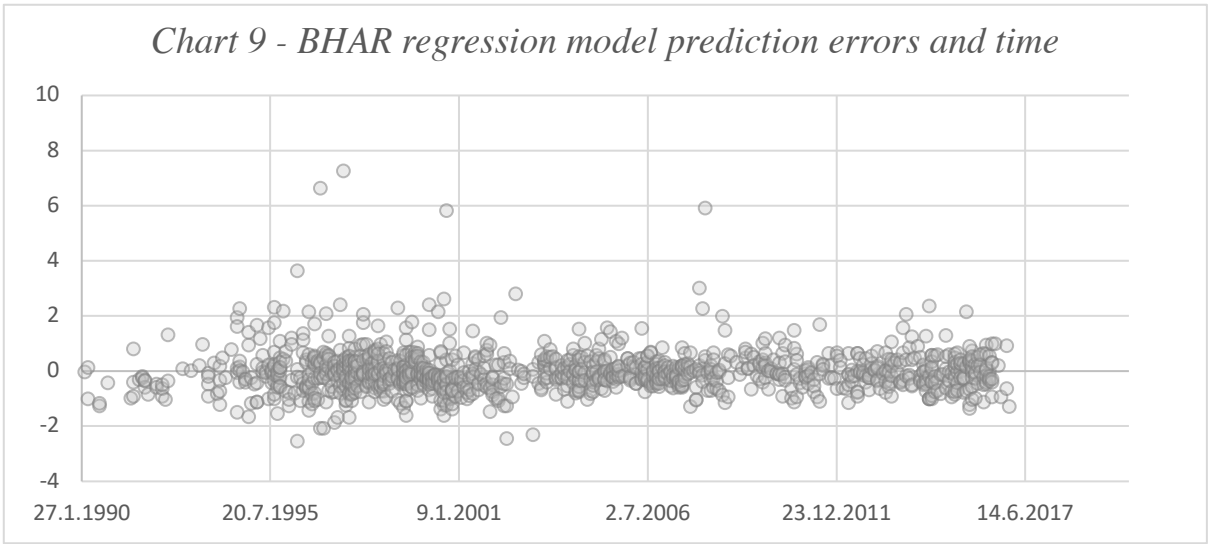

In Chart 7, on the horizontal axis is the relative size of $MV_{Target}/MV_{Acquiror}$. In Chart 8, on the left side are the prediction errors of other forms of deals, and on the right side, prediction errors of tender offers.

**3-year post-merger BHAR regression model prediction errors**

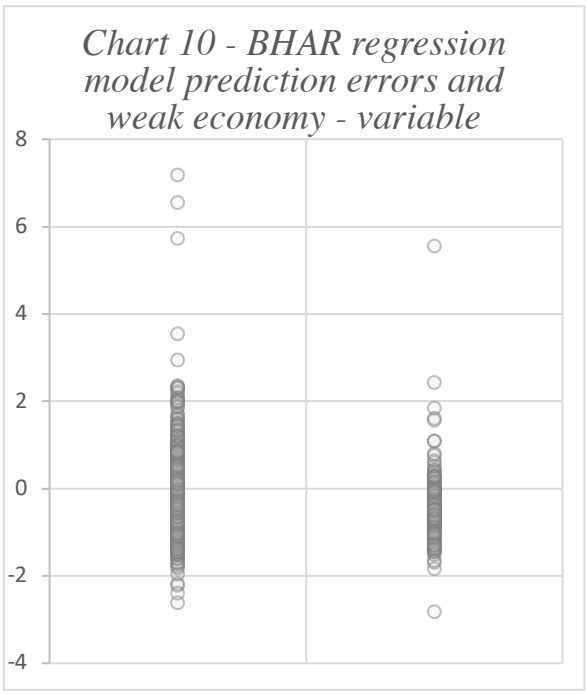
3-year post-merger BHAR – prediction model for company $i$ is as follows:

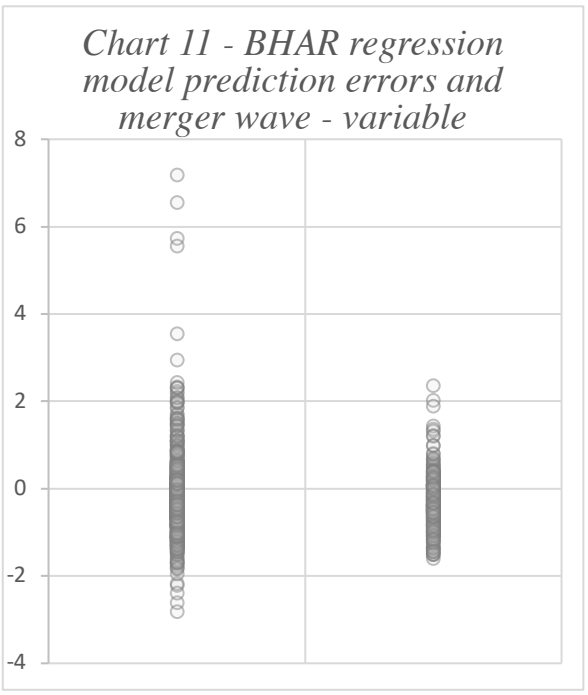
$E_i(BHAR) = \alpha + \beta_1(Weak\ economy\ dummy_i) + \beta_2(Merger\ wave\ dummy_i) + \beta_3(Tender\ offer\ dummy_i) + \beta_4(Relative\ size_i)$
$= -0.0864 - 0.2891(Weak\ economy\ dummy_i) - 0.1899(Merger\ wave\ dummy_i) - 0.0508(Tender\ offer\ dummy_i) + 0.0078(Relative\ size_i)$

BHAR prediction error for company $i$ is $E_i(BHAR) - BHAR_i$.

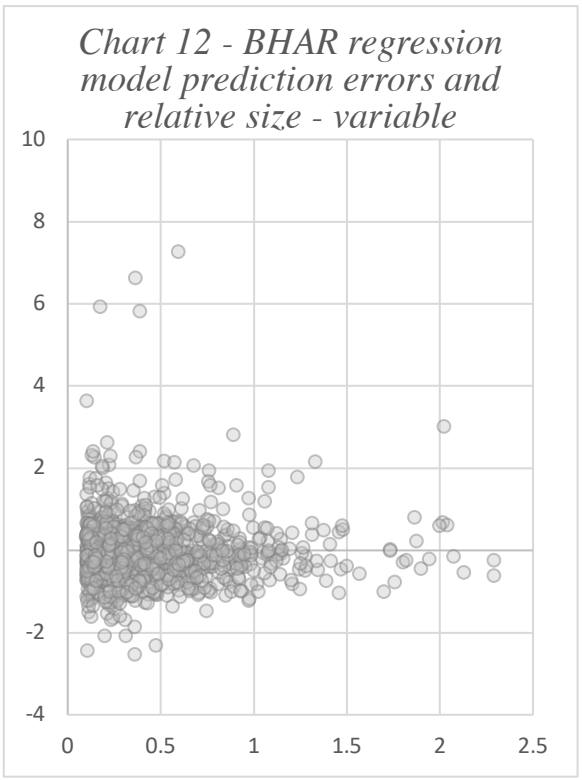


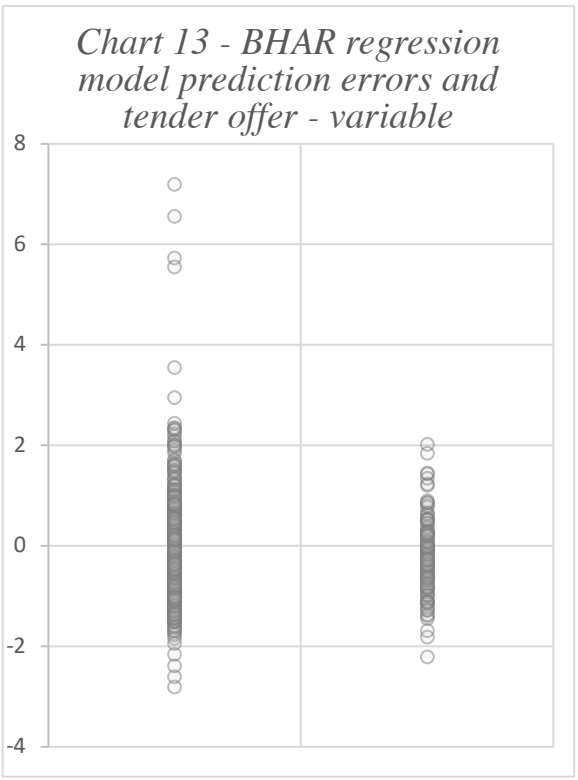

In Chart 9, horizontal axis is the announcement date of the merger. Vertical axis is the magnitude of the prediction error.




In Chart 10, on the left side are the prediction errors during normal/strong economy, and on the right side the prediction errors during weak economy. In Chart 11, on the left side are the prediction errors off merger waves, and on the right side, prediction errors on merger waves.




In Chart 12, on the horizontal axis is the relative size of $MV_{Target}/MV_{Acquiror}$. In Chart 13, on the left side are the prediction errors of other forms of deals, and on the right side, prediction errors of tender offers.